SDMS US EPA Region V

Imagery Insert Form

Document ID: 164872

Some images in this document may be illegible or unavailable in SDMS. Please see reason(s) indicated below:

☐ Illegible due to bad source documents. Image(s) in SDMS is equivalent to hard copy.

Specify Type of Document(s) / Comments:

☐ Includes _____ COLOR or _____ RESOLUTION variations.
Unless otherwise noted, these pages are available in monochrome. The source document page(s) is more legible than the images. The original document is available for viewing at the Superfund Records Center.

Specify Type of Document(s) / Comments:

☐ Confidential Business Information (CBI).
This document contains highly sensitive information. Due to confidentiality, materials with such information are not available in SDMS. You may contact the EPA Superfund Records Manager if you wish to view this document.

Specify Type of Document(s) / Comments:

☒ Unscannable Material:
Oversized __X__ or _____ Format.
Due to certain scanning equipment capability limitations, the document page(s) is not available in SDMS. The original document is available for viewing at the Superfund Records center.

Specify Type of Document(s) / Comments:

Proposed Sampling Locations Map - Drawing F-17

☐ Document is available at the EPA Region 5 Records Center.

Specify Type of Document(s) / Comments:

Rev. 07/10/02

164872 K-5 10/95

PLANNING DOCUMENTS
PHASE III REMEDIAL INVESTIGATION
ADDENDUM NO. 2
WORK PLAN AND FIELD SAMPLING PLAN

REMEDIAL INVESTIGATION/
FEASIBILITY STUDY

BELOIT CORPORATION
BLACKHAWK FACILITY
ROCKTON, ILLINOIS

OCTOBER 1995

PREPARED FOR:
BELOIT CORPORATION
ROCKTON, ILLINOIS

•••

PREPARED BY:
MONTGOMERY WATSON
MADISON, WISCONSIN

PROJECT NO. 3856.0090

MONTGOMERY WATSON

MONTGOMERY WATSON

October 20, 1995

Mr. Eric Runkel
Illinois Environmental Protection Agency
2200 Churchill Road
Springfield, Illinois 62794

Re: Phase III Work Plan
Beloit Corporation - Blackhawk Facility
Rockton, Illinois

Dear Mr. Runkel:

On behalf of Beloit Corporation, Montgomery Watson is submitting three copies of a Work Plan for the final Phase of the RI, specifically the Phase III Work Plan (dated October 1995), as requested by the Illinois Environmental Protection Agency (IEPA). This revised Phase III Work Plan addresses agreements made with IEPA during a July 26, 1995 meeting, and subsequent negotiations.

We look forward to receiving IEPA's approval of this Phase III Work Plan on or before October 25, 1995.

If you have any questions or comments regarding the enclosed Phase III Work Plan, please call.

Sincerely,

MONTGOMERY WATSON

Kenneth J. Quinn, P.G.
Principal Hydrogeologist

Enclosures: Phase III Work Plan

cc: Mr. Kevin J. Domack - Harnischfeger Industries, Inc. (1 copy)
Mr. Frederick Mueller - Johnson and Bell (2 copies)
Mr. Dennis Hays - Beloit Corporation (1 copy)
Mr. Russell Hebb - Beloit Corporation (1 copy)
Mr. Doug McLeish - Beloit Corporation (1 copy)
Mr. Terry Ayres - IEPA (1 copy)
Mr. Paul Jagiello - IEPA (1 copy)
Ms. Susan Horn - IAG (1 copy)
Mr. Kevin Phillips - Ecology and Environment (3 copies)
Ms. Mary Tierney - U.S. EPA (1 copy)
Ms. Eileen Furey - U.S. EPA (1 copy)

RJR/vlr/KJQ
J:\3856\0090\WP\RPT\98_LET.DOC
3856.0090-MD

One Science Court
P.O. Box 5385
Madison, Wisconsin
53705-0385

Tel: 608 231 4747
Fax: 608 231 4777

Serving the World's Environmental Needs

PLANNING DOCUMENTS
PHASE III REMEDIAL INVESTIGATION
ADDENDUM NO. 2
WORK PLAN AND FIELD SAMPLING PLAN

REMEDIAL INVESTIGATION/
FEASIBILITY STUDY

BELOIT CORPORATION
BLACKHAWK FACILITY
ROCKTON, ILLINOIS

OCTOBER 1995

R. Jeff Ramsby
Project Hydrogeologist

John A. Hurtenbach
Environmental Chemist

Kenneth J. Quinn
Principal Hydrogeologist

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF DRAWINGS

LIST OF APPENDICES

1

INTRODUCTION

This Phase III investigation, as with Phase II, is being conducted under the Additional Work provision of the Consent Decree to satisfy requirements of the Remedial Investigation/Feasibility Study (RI/FS). This Addendum 2 to the Beloit Corporation Blackhawk Facility (site) Remedial Investigation and Feasibility Study (RI/FS) Work Plan provides modifications and additions to the planning documents as amended by Addendum 1. These modifications and additions describe the proposed Phase III activities at the site, that will result in completion of the RI and support of the FS.

The primary objective of Phase III activities is to collect data to adequately characterize the Facility and adjacent areas for the development and evaluation of final remedial alternatives. Specifically, activities required to fulfill this objective include further delineation of the horizontal and vertical extent of Volatile Organic Compounds (VOCs) in groundwater, and performance of an Ecological Assessment (EA). Previous investigations (Phases I and II) have provided characterization and the nature of a source of VOCs located on Beloit Corporation Property and the extent of VOCs in the groundwater, except to the south of the RI boundary, to the west of the erection bay and east of the Blackhawk Acres Subdivision. EA activities will be conducted to provide a baseline biological survey of the site and sampling will be conducted to evaluate potential ecological impacts. The EA will be prepared by Illinois Environmental Protection Agency (IEPA) with sampling being conducted by Montgomery Watson Americas, Inc. (Montgomery Watson).

1.1 BACKGROUND

The RI is proceeding in a phased approach, in accordance with U.S. EPA Guidance. The Phase I investigation provided preliminary characterization of the site hydrogeology and groundwater quality. In addition, several potential source areas were evaluated. Results from the Phase I investigation identified four potential points of release: in the vicinity of the Beloit Corporation Plant (BCP), the storage yard area (SYA) of the Beloit Corporation property, the foundry sand disposal area (FSDA), and the Fiber Sludge Spreading Area (FSSA). The Phase II investigation eliminated all the potential VOC source areas, on Beloit Corporation Property, except the BCP in the vicinity of well W23, within the BCP and the SYA. In addition, sampling

in the FSDA was performed to further characterize the extent of contamination in this area. Also, surficial contamination was evaluated in the FSSA, FSDA and SYA.

The Phase II RI was completed and the results presented in Technical Memorandum No. 2 (Tech Memo 2) (Montgomery Watson, May 1995). Meetings were held between representatives of the Beloit Corporation, Montgomery Watson, IEPA, Ecology and Environment (E&E) and U.S. EPA on January 4, 1995 to discuss Tech Memo 2 and to discuss objectives of, and activities for the Phase III investigation and several dates in the summer of 1995 to further discuss Phase III of the RI.

The Phase III investigation activities are proposed to delineate the extent of VOCs in groundwater. The Phase III investigation is intended to further characterize the extent of VOCs from which final remedial alternatives can be developed and evaluated. Sampling activities will be conducted to complete collection of information required to finalize the Baseline Risk Assessment and the Ecological Assessment.

The Phase III data collection activities are to be performed as part of Task 2, Site Investigation as presented in the Work Plan (Vol. 1, Planning Documents) for the Beloit Corporation Blackhawk Facility, dated June 1992. The Phase III work will be conducted in accordance with this Work Plan Addendum which refers to the IEPA approved planning documents previously prepared for this RI/FS, where appropriate.

1.2 WORK SCOPE

The Phase III work scope is intended to adequately characterize the extent of VOCs in groundwater in order to develop and evaluate final remedial alternatives. In addition, a survey and field sampling will be performed to acquire data required for IEPA to complete the EA.

Phase III activities are based on data presented in Tech Memos 1 and 2 and are based on analytical results, as described below. Investigative locations were selected based on water table maps which have been prepared from water levels collected on a regular basis. An average water table map was presented as Drawing F15 in the Phase II Work Plans. This was based on water table maps presented in Tech Memo 1 and water levels from November 12, 1992, March 9, 1993, May 26, 1993, and August 12, 1993. Similar water levels have been observed since the August 12, 1993 measurements, which make the average water table map still applicable. This map, along with additional rounds of water levels, were used in helping to select investigation locations, as described in Section 2.

The Phase III site investigation will include the following activities:

1.2.1 Extent of VOCs in Groundwater

Phase III investigation activities will be performed in the following areas to adequately characterize the extent of VOCs:

- West of the erection bay
- South of the south property line
- East side of Blackhawk Acres, in the vicinity of existing well W29

Activities will include performance of additional water quality borings, hydraulic probe borings, well installations, and water quality sampling.

1.2.2 Ecological Assessment

The proposed EA sampling conducted during Phase III of the RI will be based on results obtained from Phases I and II. Work will include conducting sediment sampling in the Rock River and Wetland area and one water quality sample collected from a backwater area of the Rock River.

1.3 ADDENDUM FORMAT

Revisions to the original planning documents are presented in Sections 2 and 3. These sections are as follows:

- Section 2 - Addendum to the Work Plan
- Section 3 - Addendum to the Field Sampling Plan
- Section 4 - Addendum to the Quality Assurance Project Plan
- Section 5 - Addendum to the Health and Safety Plan

J:\3856\0090\WP\RPT\98_SEC1.DOC

2

ADDENDUM TO THE WORK PLAN

The following text additions are hereby incorporated into the RI/FS Work Plan (Volume 1) of the planning documents for the Beloit Corporation Blackhawk Facility RI/FS.

The following subsections describe the investigative activities to be conducted to further refine the horizontal and vertical extent of VOCs. Proposed boring locations have been chosen based on data gathered during Phases I and II of the RI and are shown on Drawing 10024910-F17.

Additionally, the EA field activities will be conducted with combined efforts of Beloit Corporation and IEPA through their contractors. A description of the proposed EA sampling activities to be undertaken by Beloit Corporation and Montgomery Watson are contained in this section.

Proposed groundwater quality borings will be drilled using the dual tube reverse circulation air rotary drilling method. The method is described in the Phase I FSP. Groundwater quality screening will be performed at 10-ft intervals to the top of clay. When the top of the clay layer is reached, a groundwater sample will be collected by pulling the drill rod back, if necessary, to collect the sample as close as possible to the top of the clay layer. In addition to the 10-ft routine sampling interval, groundwater samples will be collected at the upper interface of any significant (greater than 1 ft) clay layers encountered above the depth of the continuous clay layer (70 ft). Groundwater quality samples will be analyzed for VOCs using the GC screening method described in the approved Quality Assurance Project Plan (QAPP). A monitoring well will be installed in the groundwater quality borings, in the zone of highest contamination, or a zone specified in the following section. If more than one distinct zone of contamination exceeding the MCLs is detected, an additional well may be installed in that zone of contamination.

At all new well locations, a soil sample will be collected from the screened interval and analyzed for total organic carbon (TOC) and grain size distribution. All new monitoring wells will be sampled and analyzed for target compound list (TCL) VOCs during Phase III groundwater quality sampling. New water quality borings will be gamma logged.

Proposed hydraulic probe borings will be advanced to approximately 2 ft below the water table. The rods will then be withdrawn, and a screened interval of rod will be placed in the boring. A section of teflon tubing will be placed below the water table and a groundwater sample will be withdrawn using a hand operated pumping device. The groundwater samples will be analyzed using the field GC screening method. Following completion, the borings will be backfilled using granular bentonite.

Monitoring well construction and development is described in the approved Phase 1 planning documents.

2.1 DELINEATION OF VOCs IN GROUNDWATER

Phase III investigation activities are intended to determine potential migration pathways for VOCs from the source. The objective of these activities are to further characterize the pathways and to lead to development and evaluation of effective remedial alternatives. Selected locations for investigative activities are based on data obtained during Phases I and II of the RI.

2.1.1 West of the Erection Bay

Investigation activities in this area are intended to determine if VOCs are migrating from the source area towards the Rock River.

Groundwater levels on the Beloit site, adjacent to the Rock River, range from higher than the river on the northern portion of the site (e.g., at well W17) to lower than the river on the southern portion of the site (e.g., at well W38). This indicates the groundwater discharges to the river (i.e., flows toward the river) on the northern portion of the site and that in the southern portion of the site the groundwater is recharged by the river (i.e., groundwater flows away from the river). Well W6 is shown to be in the transition zone because the groundwater level fluctuates from slightly above to slightly below the river stage.

If groundwater from the source of VOCs (i.e., the vicinity of well W23) flows to the west, it would have to occur in an area where the groundwater level is greater than the river stage. This area changes through time, but has always been shown to be north of the vicinity of well W38 and W21, and sometimes north of well W6.

One groundwater quality boring will be conducted west of the erection bay. The borings will be conducted following previously described methods. A well will be installed at either the position containing the highest detected VOCs or, if no VOCs are detected, at the water table.

If groundwater flow discharges to the river, it is expected VOCs would be present at the water table because there would be an upward gradient. Therefore, VOCs, if present, would be present within the first permeable unit below the water table west of the erection bay.

Six hydraulic probe borings will be conducted north and west of well W6 to collect groundwater samples to evaluate the potential for VOCs migrating towards the Rock River. Groundwater samples collected from the hydraulic probes, at or near the water table, will be screened by the field GC. Up to six additional hydraulic probe locations may be conducted, if necessary, to further determine the horizontal extent of VOCs. One monitoring well may be installed in the location of the hydraulic probes.

If no VOCs above the MCLs are detected in field screening analyses at either the groundwater quality boring west of the erection bay or at HP01 through HP06, no well will be installed near HP01 through HP06. Otherwise, a monitoring well will be placed at the hydraulic probe with the highest concentration, or between HP01 and HP02. The rationale for this is that the water table well near the erection bay would satisfy the purpose of a well near the hydraulic probes. Monitoring well construction, depending on depth to water, may not adhere to previously detailed construction guidelines. Material lengths (sand pack, seal, etc.) may need to be reduced to facilitate installation. Material types, however, will remain consistent with previous installation guidelines. Installation of the monitoring well in this area will require use of an ATV drill rig and probable clearing of some trees to provide access. The new well, if installed, will be sampled for TCL volatiles during the Phase III water quality sampling.

2.1.2 South of the South Property Line

A groundwater quality boring will be drilled to the top of the clay layer and a well installed following methods described below. There is however, no data to the south/southeast to delineate the extent of VOCs. This will be addressed by conducting a groundwater quality boring downgradient of these wells. Due to concentrations detected in well W26C during Phase II groundwater quality sampling, and time that has past since, a minimum distance of approximately 500 ft downgradient would be appropriate. This distance is believed to be beyond the leading edge of VOCs migrating downgradient.

There are several physical interferences downgradient of the well nest that are problematic in locating a boring. To the south of the well nest there is a gravel pit that is not accessible to drilling equipment. The area along the north rim of the gravel pit is too close to existing wells.

To the southeast are Taylor Company and the Rockton Bus Company. The nearest practical placement for a boring would be located directly east, and in front of the Rockton Bus Company. This area is too far from the property. In addition, there is the potential for intervening sources that could interfere with delineation of VOCs associated with the Beloit Corporation NPL site.

The recommended location for a groundwater quality boring would be in the vicinity of where the railroad tracks split to the west and south (see Drawing 10024910-F17). Hydraulic effects from the gravel pit (groundwater recharge) are believed to be insignificant. There is typically no standing water in the gravel pit except during a short period in the mid to late spring. Surficial site soils would cause fast drainage of surface water in areas surrounding the gravel pit, therefore, runoff to the gravel pit would be minimal. Any runoff that may enter the gravel pit would quickly percolate and groundwater mounding would be small in magnitude and brief in duration.

If VOCs are detected above MCLs in the water quality boring south of the NPL site (W43C), a meeting will be held between Beloit Corporation and IEPA to discuss the results and determine the need for additional data. If an additional water quality boring is determined to be necessary, the location will depend on obtaining access from property owners.

2.1.3 Eastern Groundwater Investigation

A groundwater quality boring (W29C) will be drilled on the east side of the Blackhawk Acres Subdivision to delineate the eastern extent of VOCs. If there are no VOCs detected above MCLs, a well will be installed just above the basal clay layer. If VOCs are detected above the MCLs, a well will be installed as previously described.

The VOCs detected will be compared to the VOCs detected at other locations within the NPL site to determine if the suite of VOCs are consistent with previous detections. If the VOCs detected at W29C are either below MCLs or not consistent with the prior suite of VOCs, the eastern extent of VOCs in groundwater will be shown to be west of W29C. If a consistent suite of VOCs are detected at W29C above the MCLs, the eastern extent of VOCs will be shown to be east of well W29C but west of a north-south groundwater flow line that goes through well nest G108S and G108D (see Drawing 1526892-F15 from Work Plan Addendum No. 1, May 1994).

2.2 STAFF GAUGE INSTALLATIONS

Three new staff gauges are proposed in the Rock River, and its backwater area. The staff gauges are intended to supplement current monitoring points and provide additional data concerning the conductance between the river and upper aquifer system. Drawing 10024910-F17 shows the proposed locations.

2.3 GROUNDWATER QUALITY ASSESSMENT

The Round 3 groundwater quality sampling and analysis will be conducted at the existing and new wells listed in Table 2 of this Work Plan Addendum. The parameters to be analyzed and the intended data uses for this selection are listed in Table 1-3 of the QAPP Addendum (Section 4).

The Phase I Field Sampling Plan presents detailed information regarding groundwater monitoring well sampling procedures and equipment. The groundwater samples will be analyzed for the parameters listed in Table 1-1 of the QAPP Addendum (Section 4). Target compounds and QA objectives for the analyses are described in the approved QAPP.

2.4 INVESTIGATIVE DERIVED WASTES

Water produced during drilling will be stored on-site in dated, labeled 55-gallon drums, pending analytical results. Only wastes from a single boring/well will be in any single drum (i.e., wastes will not be mixed). A running tally of the number of drums used for each location, and total drums of waste will be documented and reconciled. No drilling is to be conducted in potential source areas, so no soil cuttings will be contained, except at off-site locations, depending on arrangements with the property owner.

2.5 LOCATION AND ELEVATION SURVEY

2.5.1 Location Survey

A location survey of all new monitoring wells, soil borings (including hydraulic probe locations), and staff gauges will be performed to provide horizontal ground control. Horizontal locations will be surveyed to the nearest 1 ft and tied to the Illinois State Plan Coordinate Grid System.

2.5.2 Elevation Survey

An elevation survey of all new monitoring wells and soil borings (including hydraulic probe locations) will be performed during the horizontal survey. Elevations of ground surface will be surveyed to the nearest 0.1 ft, top of protective casing and top of well casing will be surveyed to the nearest 0.01 ft. Existing staff gauges have been surveyed to the nearest 0.01 ft after being re-set in 1995. New staff gauges will be surveyed to the nearest 0.01 ft. Elevations will be relative to the National Geodetic Vertical Datum of 1929.

2.6 WATER LEVELS

One complete round of water levels will be collected following completion of the groundwater investigation and survey of new wells and staff gauges. The round of water levels will be conducted immediately prior to the sediment and surface water sample collection, which will take place in the week preceding initiation of Round III water quality sampling.

2.7 ECOLOGICAL ASSESSMENT

This subsection describes activities to be conducted in cooperation with IEPA. The IEPA requested this work plan be submitted to support the EA. The proposed activities will be performed through a joint effort between Montgomery Watson and IEPA's contractor. Beloit Corporation understands that IEPA's contractor will conduct a site walkthrough which includes a flora and fauna survey. Specific proposed tasks that will be performed are summarized below.

2.7.1 Site Survey

The survey is intended to identify flora and fauna inhabiting the site and to identify potential environmentally sensitive areas. The primary target area for the survey is the wooded area in the western portion of the site along the Rock River. The survey will be performed by IEPA's contractor with oversight provided by Montgomery Watson. IEPA will provide Beloit Corporation with 14 days notice prior to initiating the survey in order to coordinate activities. Any threatened, endangered, or environmentally sensitive species that inhabit the site, if found, the location of the sighting of the fauna or location of the flora species will be noted.

During the site walkthrough, environmentally sensitive areas, specifically wetlands, will be identified. When identified, the approximate location of wetland areas will be determined and indicated on a site map.

2.7.2 Sampling

The proposed sampling activities (as specified in 2.7.2.1 and 2.7.2.2) are intended to determine if there have been impacts to the ecology of the site. Sampling will be conducted by Montgomery Watson with oversight provided by IEPA's contractor. The primary target areas for proposed sampling is the area west and south of the source.

2.7.2.1 Sediment Sampling

Sediment samples SD01 through SD10 will be collected from the Rock River, and its backwaters, to determine if there have been impacts to the ecology of this area. Sample locations are shown on Drawing 10024910-F17. Sediment samples will be collected following completion of the groundwater investigation and prior to the Round 3 groundwater quality sampling. The location of the two proposed samples (SD03 and SD07) located at the middle and lower reaches to the river, adjacent to the site, may be modified dependent on results of the groundwater investigation to adequately assess potential groundwater discharges to the river. Sample SD02 will be collected approximately 100 ft downstream from the point of discharge from the former wastewater lagoons of the R&D Facility. Two additional sediment samples may be collected in the wetland areas if the hydraulic probe data indicates VOCs are present and discharging to the wetland. This decision will be made in the field with concurrence by the IEPA or their representative.

VOCs are the primary constituents of concern at this site. However, each sediment sample will be analyzed for TCL parameters including VOCs, SVOCs, pesticides and PCBs. TOC, pH and grain size distribution will also be analyzed in order to evaluate fate and transport mechanisms. The sediment samples from the Rock River (SD01, SD02, SD03, SD07, SD09, and SD10) will also be analyzed for TAL inorganics. The two wetland samples to be collected if VOCs are detected in the hydraulic probe samples will be analyzed for TCL organics.

2.7.2.2 Surface Water Sampling

One surface water sample will be collected from the near side of the northern portion of the Rock River backwater area (see Drawing 10024910-F17). The sample will be collected according to methods outlined in the enclosed addendum to the Field Sampling Plan and analyzed for TCL parameters including VOCs, SVOCs, pesticides, and PCBs. Handling and analysis procedures will be performed according to CLP methods described in the approved QAPP. Sample numbers and analytical parameters along with rationale for these sections are listed in Table 1-3 of the QAPP Addendum (Section 4).

J:\3856\0090\WP\RPT\98_SEC2.DOC

3

ADDENDUM TO THE FIELD SAMPLING PLAN

3.1 HYDRAULIC PROBE GROUNDWATER SAMPLING

Proposed hydraulic probe borings will be advanced to approximately 2 ft below the water table. The rods will then be withdrawn, and a screened interval of rod will be placed in the boring. A section of teflon tubing will be placed below the water table and a groundwater sample will be withdrawn using a hand operated pumping device. The groundwater samples will be analyzed using the field GC screening method. Following completion, the borings will be backfilled using granular bentonite.

3.2 SURFACE WATER SAMPLING

One surface water sample will be collected as part of the EA to estimate the extent and fate of VOCs and to determine the potential risks, if any, associated with the Rock River to complete the Baseline Risk Assessment. One surface water sample will be collected from a location in the nearside backwater area of the Rock River.

The surface water sample will be collected by directly immersing the sample bottles along the eastern bank of the Rock River backwater area, or by using a stainless steel dipper on an extension rod. Specific conductance, pH, and temperature measurements will be performed on-site during the sampling. In addition, turbidity and color will be observed, and any difficulties encountered while collecting the surface water sample will be recorded in the field notebook and approximate sample location will be marked on a site map.

The surface water sample will be analyzed for constituents presented in Table 1-1 of the QAPP Addendum (Section 4). Surface water sampling will be conducted using the U.S. EPA CLP requirements for field and laboratory quality control and documentation. Data will be generated under Level IV DQO (Level III for indicator parameters) with data validation. Samples collected during the surface water investigation will be shipped to the Analytical Laboratory using strict CLP chain-of-custody procedures. The stainless steel dipper, if used, will be decontaminated prior to its use.

3.3 SEDIMENT SAMPLING

Sediment samples will be collected as part of the EA and to determine the potential risks, if any, associated with the Rock River, to complete the Baseline Risk Assessment. Ten sediment samples will be collected from the Rock River and its backwater areas with two sediment samples potentially collected in the wetland areas (see Section 2.7.2.1 Sediment Sampling).

Access to the sediment sampling locations will be obtained using a canoe, or by direct access where water depth allows. Samples will be collected using a stainless steel hand auger or core tube. Care will be taken to avoid disturbing and losing the fraction of fine particulate matter. At locations where the sample will be collected by direct access and there is a current, the sample locations will be approached from the downstream direction. If sufficient sample volume is not obtained with initial sediment collection, additional sample will be collected and composited in a stainless steel bowl prior to placement in sample containers. Samples will be analyzed according to the QAPP. In addition, any difficulties encountered while collecting the sediment sample will be recorded in the field notebook and approximate sample locations will be marked on a site map.

The sediment samples will be analyzed as presented in the Work Plan Addendum (p. 2-6) and Table 1-1 of the QAPP Addendum (Section 4). The sediment sample will be analyzed according to the QAPP. Sediment sampling will be conducted using the U.S. EPA CLP requirements for field and laboratory quality control and documentation. Data will be generated under Level IV DQO (Level III for grain size distribution, TOC, and pH) with data validation. Samples collected during the sediment investigation will be shipped to the Analytical Laboratory using strict CLP chain-of-custody procedures. The sampling equipment will be decontaminated prior to each use.

J:\3856\0090\WP\RPT\98_SEC3.DOC

4

ADDENDUM TO THE QUALITY ASSURANCE PROJECT PLAN

The approved QAPP - Final (Warzyn, May 1994) requires revision for the Phase III Investigation activities. These revisions include replacing tables with phase specific information, and replacing Enseco Laboratories (now Quanterra) with IEA and Montgomery Watson Laboratories. References to Warzyn, now being Montgomery Watson, are revised by this reference. Revisions to specific sections in the QAPP are presented in this addendum.

Section 1.7 Project Schedule
A tentative schedule of RI/FS activities (Figure 1) for the site is presented in the Phase III Remedial Investigation Work Plan.

Section 2.1 OVERALL RESPONSIBILITY
Beloit Corporation Site Project Manager
The Beloit Corporation Site Project Manager is Mr. Kevin Domack.

Montgomery Watson Project Manager
The Montgomery Watson Project Manager is Mr. Kenneth Quinn.

Section 2.2.2 Laboratory Key Personnel
IEA - The Laboratory Project Manager is Mike McFadden. The Operations Manager is Jack Dullaghan. The Quality Assurance Officer is Linda Mitchell.

Montgomery Watson - The Laboratory Manager is Sheila Tauschek. The Laboratory Project Manager and Quality Assurance Officer is Chris Wautlet.

Section 2.2.3 Laboratory Analysis

- Analysis of sediment, groundwater and surface water samples for TCL organics using SOW (OLM02.1 or most current) methodology as specified in Table 1-1:

  IEA Laboratories
  3000 Weston Parkway
  Cary, North Carolina 27513
  1-800-444-9919

- Analysis of sediment from the Rock River for TAL inorganics using SOW (ILM03.0 or most current) methodology and pH as specified in Table 1-1:

  Montgomery Watson Analytical Testing Services
  One Science Court
  Madison, Wisconsin 53711
  1-608-231-4747

- Analysis of sediment samples for grain size distribution as specified in Table 1-1:

  Montgomery Watson Soils Laboratory
  505 Science Drive
  Madison, Wisconsin 53711
  608-231-4747

- Analysis of sediment samples for TOC as specified in Table 1-1:

  RMT Laboratories
  744 Heartland Trail
  Madison, WI 53717
  608-831-4444

2.2.4 Laboratory Data and QC - Laboratory Data

- Analytical Protocol Specified - IEA, Montgomery Watson, RMT
- Review of Analytical protocol - IEA, Montgomery Watson, RMT staff
- Internal QA/QC - IEA, Montgomery Watson, RMT

2.2.5 Performance and Systems Audits
Analytical Laboratories

- Internal audits - laboratory QAO, IEA, Montgomery Watson, RMT

3.1 Level of Quality Control Effort

Sediment, surface water and groundwater samples will be sent to IEA Laboratories, Montgomery Watson, and RMT for analysis.

3.2 Accuracy, Precision, and Sensitivity of Analysis

IEA Laboratory Practical Quantitation limits (PQLs) for VOCs, presented in Table 3-1A, will be provided for use in site evaluation.

7.2 Laboratory Analysis

Groundwater, surface water and sediment samples for TCL organics will be analyzed by IEA Laboratories according to the analytical procedures set forth in CLP SOW OLM02.1 (or most current). Sediment samples, collected from the Rock River, will also be analyzed for TAL inorganics by Montgomery Watson Analytical Testing Services according to analytical procedures set forth in CLP SOW ILM0.30 (or most current).

Sediment samples for grain size will be analyzed by Montgomery Watson Laboratories according to the analytical procedures in Appendix B of the May 1994 QAPP. Sediment samples for TOC will be analyzed by RMT Laboratories according to the analytical procedures in Appendix B of the May 1994 QAPP. Sediment samples for pH analysis will be analyzed by Montgomery Watson Laboratories according to the analytical procedures attached to this document as Appendix A.

TABLE REVISIONS

The following tables have been revised as indicated and are attached:

Table 1-1: Revised to include Phase III sampling activities
Table 1-2: Revised for Phase III sample volume requirements
Table 1-3: Revised for Phase III Data Generating Activities
Table 3-1A: Revised to include IEA MDLs.
Table 7-1: Revised to include pH analytical method for sediments

J:\3856\0090\WP\RPT\98_SEC4.DOC

5

ADDENDUM TO THE HEALTH AND SAFETY PLAN

The Health and Safety Plan Addendum will be completed prior to finalization of the Phase III Work Plan. The Addendum will primarily consist of information dealing with sediment sampling practices.

RJR/vlr/KJQ
J:\3856\0090\WP\RPT\98_SEC5.DOC
3856.0090-MD

TABLE 1

Summary of Sampling Locations and Rationale
Phase III Work Plan Addendum
Beloit Corporation - Blackhawk Facility
Remedial Investigation/Feasibility Study

Well/Boring Number	Approximate Depth	Approximate[1] Location
Deep Borings		
W29C	(2)	Near well W29 (3).
W42C	(2)	West of the southern end of the erection bay.
W43C(4)	(2)	Downgradient of well nest W26/W26C.
Hydraulic Probe Locations		
HP01 through HP06(5)	(6)	West and north of well W6.
Sediment Sample Locations		
SD01 through SD10(7)	(8)	In the Rock River and backwater areas.
Surface Water Sample Locations		
SW01	0-6 in.	In nearside backwater area of the Rock River.

NOTES:

HP = Hydraulic Probe
SD = Sediment Sample
SW = Surface Water

FOOTNOTES:

(1) See Drawing F17 for proposed boring and well locations.
(2) To the continuous clay layer at an approximate depth of 70 ft.
(3) Boring will be field located dependent on physical accessibility.
(4) One additional downgradient location may be installed, contingent on screening results.
(5) Up to six additional borings may be installed, contingent on screening results
(6) Groundwater sample will be collected from the upper 2 ft of the water table.
(7) Two additional samples may be collected, in the wetlands area, if hydraulic probe screening results indicate VOCs are discharging into the wetlands.
(8) One attempt will be made to collect the sample from within the upper 6 in. of sediment. If sediment consistency does not allow this, the sample will be collected from greater depths until sample retrieval is adequate.

RJR/vlr/KJQ
[j:\3856\0090\table-1.xls]
3856.0090-MD

TABLE 2

Summary of Analytical Parameters (1)
Phase III Work Plan Addendum
Beloit Corporation-Blackhawk Facility
Remedial Investigation/Feasibility Study

Well ID	GC Field Screening	TCL Volatiles	TCL Organics	TAL Inorganics
Existing Groundwater Monitoring Wells				
W03R		X		
W05R		X		
W08R		X		
W11R		X		
W13		X		
W14		X		
W16R		X		
W18		X		
W19		X		
W19B		X		
W21		X		
W21B		X		
W23		X		
W23B		X		
W25C		X		
W26C		X		
W31C		X		
W32		X		
W34		X		
W38		X		
W41		X		
G103S		X		
G103D		X		
G107		X		
G108S		X		
G108D		X		
Proposed Groundwater Monitoring Wells				
New Wells (2)		X		
Proposed Groundwater Quality Borings				
W29C	X			
W42C	X			
W43C	X			
Proposed Hydraulic Probe Borings				
HP01 through HP06(3)	X			
Proposed Sediment Samples (4)				
SD01			X	X
SD02			X	X
SD03			X	X
SD04			X	
SD05			X	
SD06			X	
SD07			X	X
SD08			X	
SD09			X	X
SD10			X	X
Proposed Surface Water Sample				
SW01			X	

(1) This table presents a summary of analytical parameters for Phase III. An "x" indicates the sample is to be analyzed for that parameter. A blank space indicates the analysis will not be performed.

(2) Number of new wells to be 3 if no VOCs above MCLs are detected west of the erection bay and downgradient of well nest W26/W26C; 4 or 5 if VOCs are detected above MCLs west of the erection bay and downgradient of wells W26/W26C.

(3) Up to six additional borings may be conducted, contingent on screening results.

(4) Two additional samples may be collected in the wetlands and analyzed for TCL organics if hydraulic probe screening results indicate VOCs are discharging into the wetlands

RJR/ls/KJQ
J:/3856/0090/Table-2.xls
3856.0090-MD

TABLE 1-1

QAPP Addendum
Phase III Investigation
Sample Type and Estimated Number of Samples
Beloit Corporation RI/FS

Sample[1] Matrix	Lab[2]	No. of Samples	Field Duplicate	Field[3] Blanks	MS/MSD[4]	Total No. Samples	Test[5] Parameters	Field Parameters
Sediments[6]	IEA	10 to 12	1	-	-	11 to 13	TCL Organics	-
	MW	6	1	-	-	7	TAL Inorganics	-
	RMT	10 to 12	-	-	-	10 to 12	TOC	-
	MW	10 to 12	-	-	-	10 to 12	pH	-
	MW	10 to 12	-	-	-	10 to 12	Grain Size Distribution	-
Groundwater Screen[7]	Field	24	3	1/day	-	27±	Field GC Volatiles	Field GC
Groundwater[8]	IEA	29 to 31	3	3	2	37 to 39	TCL Volatiles	pH, Conductivity, Temperature
Surface Water	IEA	1	1	-	1	3	TCL Organics	pH, Conductivity, Temperature

Footnotes:

(1) Samples will be considered low concentration and will be packaged and shipped accordingly.

(2) Montgomery Watson Americas, Inc.
One Science Court
Madison, Wisconsin 53711

RMT
744 Heartland Trail
Madison, WI 53717

IEA
3000 Weston Parkway
Cary, NC 27513

(3) A trip blank for VOC analysis will be included with each cooler shipped for aqueous groundwater samples. Trip blanks are not included in the total number of samples.

(4) EXTRA VOLUME REQUIREMENT: Extra volume is required for the aqueous MS/MSD quality control requirement (triple volume for VOCs). MS/MSD samples are included in the total number of samples.

(5) Refer to Tables 3-1 and 3-2 for the TCL organics required detection limits.

(6) Actual number of samples dependent on field GC screening of water from hydraulic probe borings. Two contingency samples to be analyzed for TCL organics. Refer to Table 1-3 for further detail.

(7) Actual number of samples dependent on number of hydraulic probe borings and groundwater quality boring depths.

(8) Actual number of samples dependent on number of new wells installed. Refer to Table 1-3 for further detail.

TABLE 1-2

QAPP Addendum
Phase III Investigation
Sample Quantities, Containers, Preservatives and Packaging Requirements
Beloit Corporation RI/FS

Analysis	Bottles and Jars	Preservation	Technical Holding Time[1]	Volume of Samples	Shipping	Normal Packaging
Low Concentration (Organics)						
Groundwater and Surface Water						
Volatiles	Four 40-mL volatile organic analysis (VOA) vial.	1:1 HCL (2 drops/ vial), iced to 4°C.	14 days from sampling date	Fill completely no headspace	Shipped daily by overnight carrier	Vermiculite
Semivolatiles	Two 1L amber glass bottles	Iced to 4°C	5 days to extraction, 40 days to analysis	Fill completely	Shipped daily by overnight carrier	Vermiculite
Pesticide/PCB	Two 1L amber glass bottles	Iced to 4°C	5 days to extraction, 40 days to analysis	Fill completely	Shipped daily by overnight carrier	Vermiculite
Low or Med Concentration (Organics)						
Sediment Samples						
Volatiles	Two 4-oz wide mouth glass jars	Iced to 4°C	14 days from sampling date	Fill completely no headspace	Shipped daily by overnight carrier	Vermiculite (Med in cans/vermiculite)
Semivolatiles	One 8-oz wide mouth glass jar	Iced to 4°C	10 days to extraction, 40 days to analysis	Fill completely	Shipped daily by overnight carrier	Vermiculite (Med in cans/vermiculite)
Pesticide/PCB	One 8-oz wide mouth glass jar	Iced to 4°C	10 days to extraction, 40 days to analysis	Fill completely	Shipped daily by overnight carrier	Vermiculite (Med in cans/vermiculite)
Low or Medium Concentration (Inorganics)						
Sediment Samples						
Metals	One 8-oz wide mouth glass jar	Iced to 4°C	6 months (28 days for mercury)	Fill completely	Shipped daily by overnight carrier	Vermiculite (Med in cans/vermiculite)
Cyanide	One 8-oz wide mouth glass jar	Iced to 4°C	14 days	Fill completely	Shipped daily by overnight carrier	Vermiculite (Med in cans/vermiculite)
Physical Analysis						
Sediment and Soil Samples						
Grain Size Distribution, pH	Two 8-oz. wide mouth glass jars	None	Not established	Fill ¾ full	Ship by carrier	Vermiculite
Total Organic Carbon	One 4-oz wide mouth glass jar	None	28 days from collection	Fill ¾ full	Ship by carrier	Vermiculite

General Notes:

1. The packaging material should completely cushion the sample bottles - bottom, sides and top.
2. Technical hold times begin on the date sampled, and supersede contractual SOW hold times.

JAH/vlr/RJR
J:\3856\0090\WP\TBL\99_TB1-2.DOC
3856.0090-MD

TABLE 1-3

QAPP Addendum
Phase III Investigation
Summary of Data Generating Activities and Associated Quality Objectives
Beloit Corporation RI/FS

Activity	Description	Intended Data Usages	Parameters	Data Quality Objective	Anticipated No. of Investigative Samples
Sediments	Collect and analyze 10 to 12 sediment samples from the Rock River and backwater areas for TCL organics. The 6 samples from the Rock River will also be analyzed for TAL inorganics. See Work Plan Section 2.	Determine presence of constituents in sediments.	TCL Organics TAL Inorganics TOC pH Grain Size	Level IV Data Level IV Data Level III Data Level III Data Level III Data	10 to 12 6 10 to 12 10 to 12 10 to 12
Deep Soil Borings(1)	Drill 3 deep borings. Collect and analyze groundwater at 10-ft intervals for VOCs. Analyze soil from screened interval for TOC and grain size distribution. See Work Plan, Section 2 for selection criteria.	Soil borings will be used to characterize site geology, and screen groundwater for VOCs with changes in depth, and to select well location.	Field GC VOC (Water) TOC Grain Size	Level II Data Level III Data Level III Data	27± 3 3
Hydraulic Probe Borings	Complete 6 hydraulic probe borings and collect groundwater samples for VOC screening.	Determine if VOCs are migrating towards the Rock River from the source area to select monitoring well location.	Field GC VOC	Level II Data	6 with 6 more contingent on results
Groundwater Sampling(2)	Round 3 sampling of 29 to 31 monitoring wells for TCL volatiles (see Table 2 of Work Plan Addendum No. 2 and Table 1-1 of QAPP Addendum	Characterize and evaluate the extent of VOCs in groundwater.	TCL Volatiles	Level IV Data	29 to 31 dependent on screening results
Surface Water Sampling	Collect 1 surface water sample.	Ecological Assessment.	TCL Organics	Level IV Data	1

Footnote:

(1) Two contingency wells are possible. See Section 2.1.2 of text for further detail.
(2) The number of groundwater samples collected is contingent upon the number of wells installed in the groundwater investigation.

TABLE 3-1A

QAPP Addendum
Phase III Investigation
TCL and TAL
Method Detection Limits
Beloit Corporation RI/FS

Compound	Water (ug/L)	Low Soil (ug/kg)
Volatiles		
Chloromethane	2.4	4.8
Bromomethane	0.9	4.7
Vinyl chloride	3.5	4.3
Chloroethane	1.8	4.4
Methylene chloride	1.3	3.4
Acetone	2.6	9.1
Carbon disulfide	0.7	3.4
1,1-Dichloroethene	1.2	3.8
1,1-Dichloroethane	0.8	3.5
1,2-Dichloroethene (total)	1.2	3.8
Chloroform	0.8	3.4
1,2-Dichloroethane	0.8	4.0
2-Butanone	2.5	4.5
1,1,1-Trichloroethane	1.0	3.3
Carbon tetrachloride	0.9	3.0
Bromodichloromethane	0.5	3.1
1,2-Dichloropropane	1.2	3.5
cis-1,3-Dichloropropene	0.9	3.6
Trichloroethene	1.1	3.4
Dibromochloromethane	1.2	3.1
1,1,2-Trichloroethane	1.3	4.0
Benzene	0.7	3.2
trans-1,3-Dichloropropene	1.2	2.8
Bromoform	1.6	2.9
4-Methyl-2-pentanone	2.0	3.1
2-Hexanone	3.2	4.6
Tetrachloroethene	0.8	3.9
Toluene	2.3	3.7
1,1,2,2-Tetrachloroethane	0.9	3.7
Chlorobenzene	1.0	3.3
Ethylbenzene	0.9	3.8
Styrene	0.8	3.1
Xylenes (total)	1.0	3.5
Semivolatiles		
Phenol		71
bis(2-Chloroethyl) ether		58
2-Chlorophenol		50
1,3-Dichlorobenzene		29
1,4-Dichlorobenzene		35
1,2-Dichlorobenzene		51
2-Methylphenol		58
2-2'-oxybis(1-Chloropropane)		60
4-Methylphenol		75
N-Nitroso-di-n-propylamine		60

Hexachloroethane		34
Nitrobenzene		32
Isophorone		38
2-Nitrophenol		40
2,4-Dichlorophenol		75
bis(2-Chloroethoxy) methane		43
2,4-Dichlorophenol		53
1,2,4-Trichlorobenzene		29
Naphthalene		37
4-Chloroaniline		69
Hexachlorobutadiene		38
4-Chloro-3-methylphenol		76
2-Methylnaphthalene		40
Hexachlorocyclopentadiene		22
2,4,6-Trichlorophenol		27
2,4,5-Trichlorophenol		28
2-Chloronaphthalene		30
2-Nitroaniline		63
Dimethylphthalate		44
Acenaphthylene		39
2,6-Dinitrotoluene		45
3-Nitroaniline		47
Acenaphthene		43
2,4-Dinitrophenol		52
4-Nitrophenol		78
Dibenzofuran		46
2,4-Dinitrotoluene		45
Diethylphthalate		61
4-Chlorophenyl-phenylether		36
Fluorene		55
4-Nitroaniline		64
4,6-Dinitro-2-Methylphenol		27
N-Nitrosodiphenylamine		19
4-Bromophenyl-phenylether		11
Hexachlorobenzene		24
Pentachlorophenol		31
Phenanthrene		25
Anthracene		24
Carbazole		28
Di-n-Butylphthalate		314
Flouranthene		37
Pyrene		43
Butylbenzylphthalate		36
3,3'-Dichlorobenzidine		28
Benzo(a)anthracene		31
Chrysene		32
bis(2-Ethylhexyl)phthalate		31
Di-n-octylphthalate		58
Benzo(b)fluoranthene		30
Benzo(k)fluoranthene		44
Benzo(a)pyrene		40
Indeno(1,2,3-cd)pyrene		42
Dibenz(a,h)anthracene		38
Benzo(g,h,i)perylene		35

Pesticides\PCBs		
alpha-BHC	0.050	1.7
beta-BHC	0.050	1.7
delta-BHC	0.050	1.7
gamma-BHC (Lindane)	0.050	1.7
Heptachlor	0.050	1.7
Aldrin	0.050	1.7
Heptachlor epoxide	0.050	1.7
Endosulfan I	0.050	1.7
Dieldrin	0.10	3.3
4,4'-DDE	0.10	3.3
Endrin	0.10	3.3
Endosulfan II	0.10	3.3
4,4'-DDD	0.10	3.3
Endosulfan sulfate	0.10	3.3
4,4'-DDT	0.10	3.3
Methoxychlor	0.50	17
Endrin ketone	0.10	3.3
Endrin aldehyde	0.10	3.3
alpha-Chlordane	0.050	1.7
gamma-Chlordane	0.050	1.7
Toxaphene	5.0	170
Arochlor-1016	1.0	33
Arochlor-1221	2.0	67
Arochlor-1232	1.0	33
Arochlor-1242	1.0	33
Arochlor-1248	1.0	33
Arochlor-1254	1.0	33
Arochlor-1260	1.0	33
Metals		**mg/kg**
Aluminum		10.0
Antimony		0.40
Arsenic		0.20
Barium		2.00
Berylium		0.04
Cadmium		0.04
Calcium		200
Chromium		0.04
Cobalt		2.00
Copper		2.00
Iron		4.00
Lead		0.30
Magnesium		200
Manganese		2.00
Mercury		0.04
Nickel		4.00
Potassium		20.0
Selenium		0.40
Silver		0.10
Sodium		400
Thalium		0.20
Vanadium		4.00
Zinc		2.00
Cyanide		1.25

This table presents Method Detection Limits (MDLs) for organic compound analyzed using CLP methodology.

Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on a dry weight basis as required by the method, will be higher.

Method detection limits are updated periodically. Exact MDLs will represent the current calculated MDL.

JAH/vlr/RJR
J:\3856\0090\WP\TBL\99_TB3-1.DOC
3856.0070-MD

TABLE 7-1

QAPP Addendum
Phase III Investigation
Summary of Analytical Methods
Beloit Corporation RI/FS

Parameter	SOP[1]	Method[2]
Laboratory Analysis		
TCL Organics	SOW OLM02.0	CLP Protocol
TAL Inorganics	SOW ILM03.0	CLP Protocol
Field Measurements		
Field GC VOCs	BC-FGC	SW-846 8310/8010/8020
pH	pH1	EPA 150.1
Specific Conductance	CONDYSIF	EPA 120.1
Physical Parameters		
PID	HNU IOP[3]	NA
Grain Size Analysis	903	ASTM D422, D1140
Total Organic Carbon	RMT 2.44	SW-846 9060
pH (Soils)	329	SW-846 9045

Footnotes:

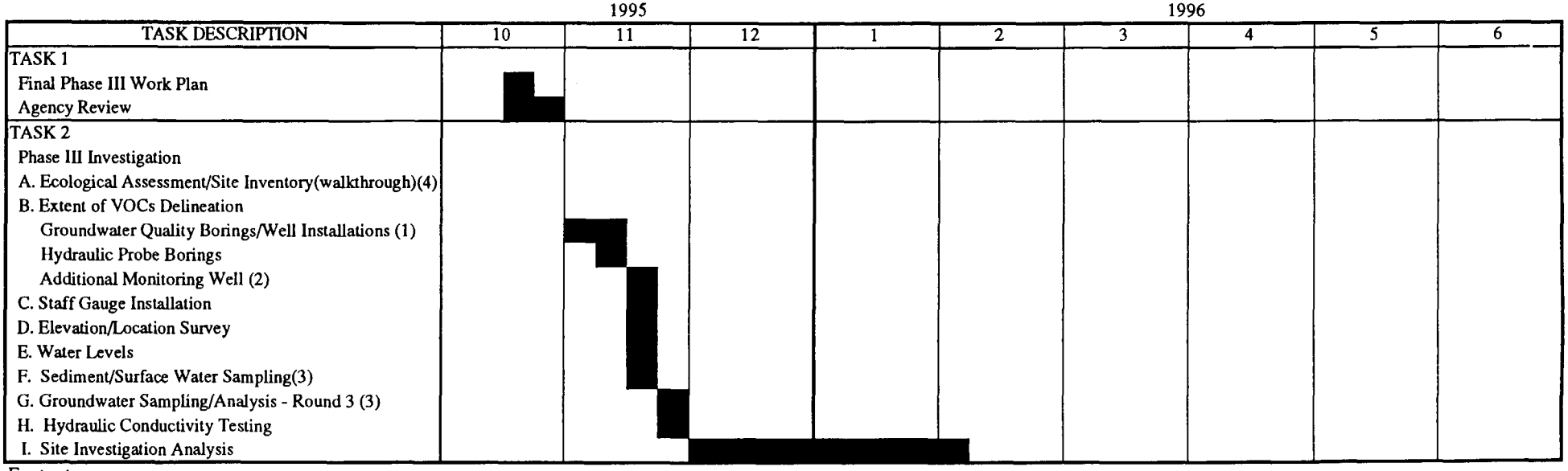
(1) SOP refers to either the EPA SOW, or the laboratory document number.
(2) Method refers to the published analytical reference.
(3) Refer to FSP.

JAH/vlr/RJR
J:\3856\0090\WP\TBL\99_TB7-1.DOC
3856.0090-MD

FIGURES

FIGURE 1

Anticipated Remedial Investigation Project Schedule
Phase III
Beloit Corporation Blackhawk Facility
Remedial Investigation/Feasibility Study



Footnotes:

(1) Field GC Screening

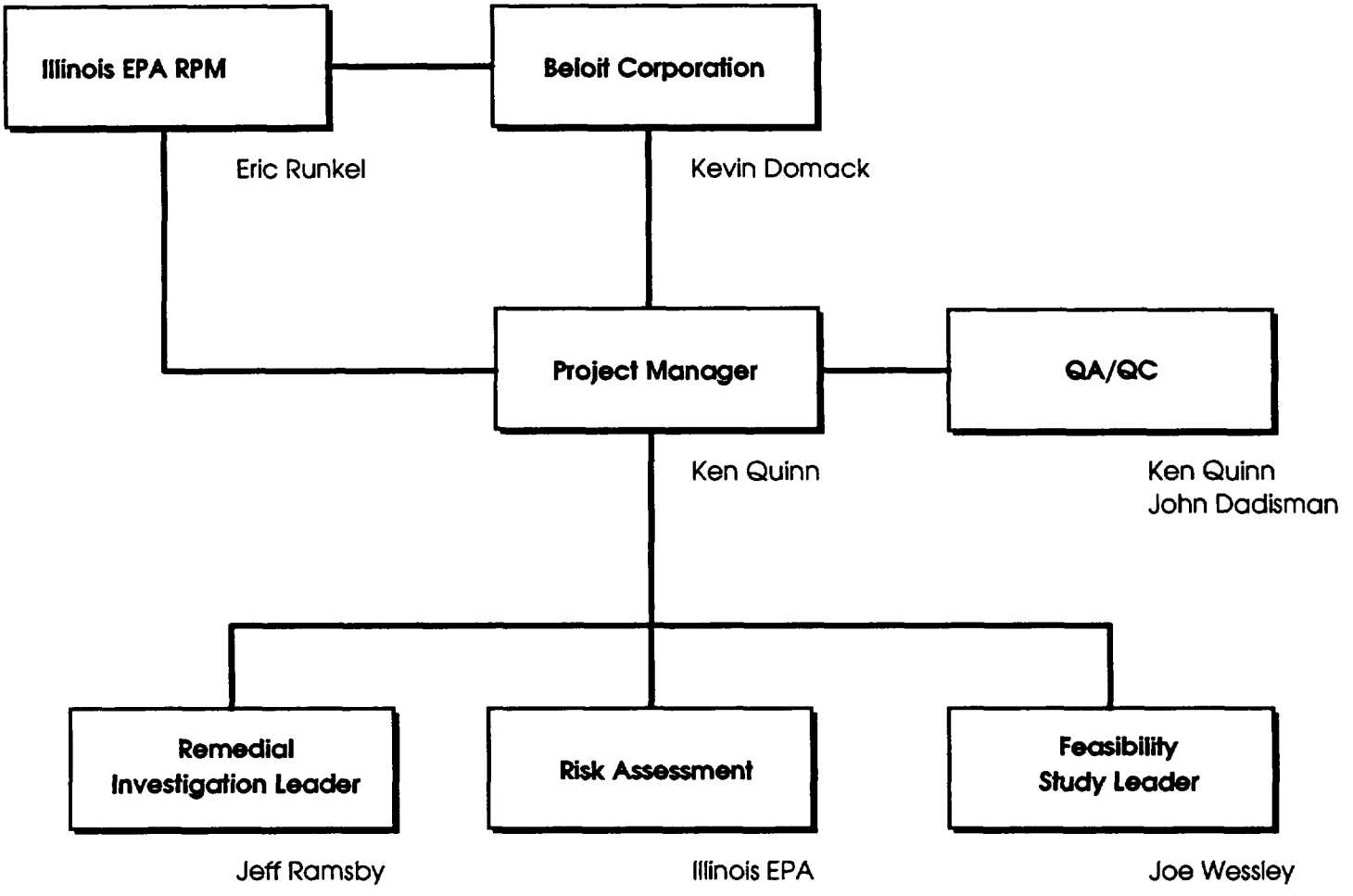
(2) Includes one well that may be installed based on hydraulic probe boring results.

(3) Analytical turnaround time is estimated to be 35 working days.

(4) To be scheduled by IEPA

RJR/rjr/KJQ
G:\Archive\10024910\tables\figure1m.xls
10/20/95

Figure 2-I
Project Organization Chart
Remedial Investigation/Feasibility Study
Beloit Corporation, Rockton Facility



DRAWINGS

APPENDICES

A

LABORATORY METHOD STANDARD OPERATING PROCEDURE (pH)

LABORATORY METHOD STANDARD OPERATING PROCEDURE

Section: Wet Chemistry Manual Methods	Section No. 3	Revision No. 5	Effective Date 04-21-95
SOP Description: Soil pH	SOP No. 329	Document No. wc\329.wpd	Page 1 of 5
Reviewed By: K. Howard	Approved By: G. Gerry		

SOIL pH

Scope and Application
This method applies to the pH determination of soils.

Method Summary
Potentiometric/calcium chloride addition.

Method Reference
"Soil Chemical Analysis", M.L. Jackson, First Course, 6th Print, 1970, p. 39-49.

"Test Methods for Evaluating Solid Waste", SW-846, July 1992, Method 9045.

Reporting Limit
Sensitivity to 0.01 pH unit

Optimum Range
1.00 - 12.00

Sample Handling
Determine on-site, if possible, otherwise within 24 hours.

Reagents and Apparatus
1. pH meter (Orion 901 or Orion SA210)
2. Combination pH electrode.
3. Magnetic stirrer and stir bars.
4. Beakers
5. pH buffer solutions, pH 4.00, 7.00, and 10.0.
6. Deionized water
7. $CaCl_2$ Solution (0.01 M)

Reagent Preparation

1. **Calcium Chloride Solution, 0.01M:** Weigh out 1.11g $CaCl_2$ and dissolve in deionized water, dilute to 1 liter and mix.

Notes

1. The most common error is failure to obtain a representative sample. Make sure the sample is thoroughly mixed or composited prior to analysis.

2. The pH test is temperature dependent. Therefore, temperatures of buffers and samples should be within 2°C of each other. Allow samples to come to room temperature before analysis.

3. Interferences in pH measurements occur with presence of weak organic and inorganic salts, and oil and grease. If oil and grease are visible, note on data sheet. Clean electrode with soap and water, followed by 10% HCl and deionized water. Then recalibrate meter before analysis of next sample.

4. Electrode should be stored in pH 7.00 buffer, or electrode storage solution.

Procedure

1. All glassware is to be soap and water washed, tap rinsed and deionized water rinsed prior to analysis.

2. **Calibration:**

   ORION SA210 pH Meter:

   a. Place combination electrode in fresh pH 7.00 buffer solution. Note: Buffers should be stirred slowly while taking measurements.
   b. After allowing meter to stabilize, turn calibration dial until reading of 7.00 is obtained.
   c. Rinse electrode with deionized water and place in pH 4.00 buffer solution.

d. Wait for reading to stabilize and then turn slope adjustment dial until reading of 4.00 is obtained.
e. Rinse electrode with deionized water and place in pH 7.00 buffer. If meter reading is not 7.00±0.05, repeat Steps a-d.
f. Rinse electrode with deionized water and place in pH 10.00 buffer. Reading must be in the range of 9.95-10.05 or calibration must be repeated.

ORION 901 pH Meter:

a. Turn STD thumbwheel to read 7.000.
b. Set mode switch to pH.
c. If SET BLANK light is on, press to turn off.
d. Set slope thumbwheel to +58.2.
e. Place electrode in 7.0 buffer and press CLEAR/READ MV button. Note: Buffers should be stirred slowly while taking measurements.
f. After reading stabilizes, press SET CONC.
g. Rinse electrode and place in pH 4.0 buffer.
h. After reading stabilizes, adjust the slope thumbwheel until a reading of 4.00 is obtained.
i. Rinse the electrode and place in pH 10.0 buffer. The reading should be 9.95 - 10.05. If not, repeat Steps e-i.
j. Refer to Maintenance sections of pH meter and electrode instruction manuals if problems with calibration exist.

3. Weigh out 25g of soil in a 100 mL beaker. Record weight.

4. Suspend the sample in 50 mL of 0.01M $CaCl_2$ solution by using a stir bar and magnetic stirrer.

5. Immerse electrode in sample. Allow sufficient time for reading to stabilize. Record pH. Rinse electrode with deionized water.

Quality Control

1. Summary of QC Requirements (Routine Analysis):

Audit	Frequency	Control Limits
ICV/CCV (7.00 S.U.)	Initially, every 10 readings, and end of run	±0.05 pH unit
Duplicate	1 per 10 samples	Calculated quarterly limits

2. Summary of QC Requirements (CLP Protocol):

Audit	Frequency	Control Limits
ICV/CCV (7.00 S.U.)	Initially, every 10 readings, and end of run	±0.05 pH unit
LCS	After ICV	95% CI (±0.05 pH unit if no limits specified)
Duplicate	1 per 10 samples	Refer to specific Project QAPjP

4. Check standards (ICV/CCV) must be within the acceptable control limits or appropriate action shall be taken and a corrective action report completed.

5. A Laboratory Control Sample (LCS) is a reference standard prepared by an outside source (usually ERA or EPA). Results must be within acceptable control limits or appropriate action shall be taken and a corrective action report completed.

6. Duplicates are to be within acceptable control limits or appropriate action shall be taken and a corrective action report completed. For CLP protocol analysis, associated data shall be flagged "*" if duplicate control limits are exceeded.

Section: Wet Chemistry Manual Methods	Section No. 3	Revision No. 5	Effective Date 04-21-95
SOP Description: Soil pH	SOP No. 329	Document No. wc\329.wpd	Page 5 of 5

SOP Revision Date

1. 07-28-86
2. 06-26-90
3. 06-30-93
4. 01-31-94
5. 04-21-95

J:\MWATS\SOPS\WC\329.WPD